to a "life force" to account for the specific activities that occur in living cells (this life force being acquired from other cells).

Although the cell wall had been the focus of investigations for plant cells from the time of Hooke through the investigations of Brown and Schleiden, Hooke had already noted the fluid contents of cells. He labeled them "*succus nutritus*, or appropriate juices of vegetables," and described cells "fill'd with juices, and by degrees sweating them out" (Hooke, 1665, p. 116). With the improved microscopes of the 1830s, featuring achromatic lenses, more investigators began commenting on the fluid contents of cells. Von Mohl, for example, described "an opaque, viscid fluid, having granules intermingled in it" as a universal feature of cells (1852, p. 37). In 1846 von Mohl had applied the term *protoplasm*[16] to the fluid. Slightly earlier, Dujardin (1835) labeled the viscid, slimy fluid found in animal tissues *sarcode*.[17] Remak (1852) pointed to the similarities between plant protoplasm and animal sarcode and employed the term *protoplasm* for both. This identification was cemented when Max Schultze (1861) characterized a cell as "a lump of protoplasm inside of which lies a nucleus" (p. 11). For Schultze, protoplasm was sufficiently nonmiscible with fluids surrounding the cell that a cell membrane was not needed; he rather viewed it as a sign of cell senility.

As I will discuss below, cytologists for the most part kept their focus on the structural components of the cell and on the processes involved in cell division. A number of chemically minded physiologists, though, made the special chemical nature of protoplasm their pursuit. Many of them also developed mechanistic accounts of cell functioning. One exemplar of this approach was T. H. Huxley's popular essay, "On the physical basis of life" (Huxley, 1869), in which he proposed a three-point unity among living things – they all exhibit the power of contractility, are composed of cells (defined à la Schultze), and are made of protoplasm. He took protoplasm to be comprised of proteins, whose chemical composition of carbon, hydrogen, nitrogen, and oxygen had been established in the 1830s. Huxley's objective was simply to provide a

[16] Six years earlier Purkinje introduced the same term for the embryonic material in animals, but von Mohl seems to have been unaware of this. Part of the significance of protoplasm for von Mohl was that he viewed it as providing the material for a new cell nucleus, whose formation would prompt division of the old cell.

[17] Dujardin made it clear that he was giving a name to a substance that had been observed earlier by others: "I propose to give this name to what other observers have called a living jelly, this glutinous, diaphanous substance, insoluble in water, that contracts into globular lumps, sticks to dissecting needles, and can be drawn out like mucus. It is to be found in all lower animals interposed between other structural elements" (1835, translated by Harris, 1999, p. 74).

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